1st

NO 4

Inaugural Dissertation
On
The Proximate Cause of Febrile Reaction.

Non ex causis, nec ex sede morborum, ad eorum symptomata; sed ex symptomatis ad sedem causasque morborum est procedendum, tutoque progredi potest medicus.

Sauvages.

By J Mitchell

admitted Mar 4 1819

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Part First.

From the earliest period of medical record, men appear to have been attracted by the peculiar and interesting phenomena of animal life. — They saw, as they supposed, a self-moving machine; and sought in itself a solution of the question concerning its nature. — The earliest notions therefore of animal life & action, consisted in the belief, that it is derived from some internal moving principle capable of exertion without external impulse. — Once established, this popular opinion maintained an ascendancy, amidst conflicting systems and theories, down to a very recent period. — The Ἰσοροπία of Hippocrates; the Nature of Sydenham; the Archaeus of Van Helmont; the Vis Medicatrix Naturae of Paulinus; the Anima Medica of Stahl, & Nichols; and the Impetum Faciens of Hermann Boerhaave; sufficiently attest the belief of these writers that the animal machine is self-motive. —

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It is not therefore to be wondered at, that the theories of the causes and nature of febrile diseases, assumed this opinion as their basis, and founded upon it their superstructures. — The writings of Stahl, Hoffman, Boerhaave, & Cullen, all attribute the principal phenomena of disease to this mysterious power, and draw from it an elucidation of their respective theories.

All these fine "frost works of fancy", have, one by one, been consigned to forgetfulness; and, of the numerous expositions of febrile action derived from the doctrine of an internal moving principle, that of Dr William Cullen alone remains; and it also, but for the more useful discoveries of its author, would have perished with the rest. —

Dr Cullen's Theory.

Few men were better calculated to establish an innovation than Dr Cullen. — Learned, laborious, zealous, and observant, he was alike distinguished for

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the originality of his conceptions, and for the power and address displayed in their developement. — In addition to all this, he was at the head of the greatest medical seminary in the world; where he enjoyed an opportunity of exhibiting his opinions to minds nearly incapable of resisting the influence of reputation & of eloquence. — The excellence too of his practical precepts, resulting from patient observation, was no slender support to the theory with which they were interwoven. —

This celebrated theory is too well known to require either detail or refutation. — It traces all febrile diseases to a diminution of the energy of the brain, by which the cold stage of fever is induced. — It supposes that the Vis Medicatrix Naturæ causes a spasmodic contraction of the cutaneous organs, and a consequent reaction to overcome that spasm, for the purpose of restoring to the system its equilibrium. —

This very cursory view of a theory, exhibited by its promulgator with the most imposing accompaniments, is sufficient to prove, that not one single step, in

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the whole process of reasoning, is taken without an hypothesis. — The inconsistency of the opinion that atony and spasm exist in the same vessels at the same time; the absurdity of supposing that mechanical impulse can produce secretory action; and that the retrocession of circulation caused by a want of energy in the brain should be obviated by the vis medicatrix Naturæ, previous to the recovery of that energy; all render the task of refutation unnecessary. —

Notwithstanding the palpable absurdity of this famous theory, it became the fashionable dogma of the day, and reigned triumphant in the highest medical schools. — When therefore, Brown, in that daring spirit of innovation, characteristic of his genius, trampled this splendid fabric in the dust, the and erected upon its ruins his simple & imposing system, the minds of men, trammeled by the errors of education, and the fetters of authority, gazed in doubtful astonishment upon the havoc he had made; and upon the wide & novel views presented to their imagi-

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Dr. Brown's Theory.

The theory of Dr. Brown constitutes a new era in medical speculation. — Previous to his time, as before observed, all theories of proximate cause were founded upon the supposed existence of an internal moving principle: but the very first step of Brown was upon this long acknowledged point; which he declared to be equally absurd & untenable. Denying the existence of an internal moving principle, he contended that life is a "Forced State", dependent, altogether, upon the operation of extraneous agents, denominated, from this circumstance, stimuli. — He called that power or condition of animal life, over which stimuli exert their influence, <u>excitability</u>; and the effect of that influence <u>excitement</u>. — According to the quantity of excitability, and the power of the stimuli, he supposed the energy

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of action; asserting, that the total absence of either, must necessarily produce that change which is termed death. — Upon the whole, he contends that excitability is an uniform, indivisable, universal, property, resident in every living body, whether animal or vegetable; to whose operation the constant application of stimuli is necessary; which excitement tends constantly to exhaust; & which accumulates in consequence of the absence of stimuli: that the condition of the system or function is, in either case, debilitated; and, that the debility is produced, in the former case <u>indirectly</u>, in the latter <u>directly</u>. — Between the two extremes of direct and indirect debility, there is one point at which the excitability and stimuli are so proportioned to each other as to constitute the condition called health. All other proportions, beyond a certain limit, were supposed to constitute the condition

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Reaction was, in all cases, ascribed to an accumulation of excitability, during the absence or diminution of the habitual stimuli. —

This is a very naked outline of that celebrated theory, under which, the doctrines connected with an internal self-motive power have gradually sunk; notwithstanding the important support which they derived from the talents and station of Cullen. —

But in spite of its celerity, & simplicity, the theory of Brown is liable to many solid objections. — The author has committed a great error, in regard to what he calls direct debility; in which, as ably shewn by Wilson, in his essay upon the same subject, an accumulation of irritability is perceptible, only in that organ from which its wonted stimulus has been partially or totally abstracted; while those organs secondarily affected, exhibit a condition similar to that which they assume, in cases of indirect

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It follows therefore, that, whether a disease be produced by exhaustion or abstraction, the condition of parts secondarily affected is that of exhaustion. — It also follows that reaction can be as little the result of accumulation of excitability, in the one case as in the other; because both are alike productive of an exhausted or diminished irritability in the heart and arteries, which can be, but seldom, if ever, the primary seat of febrile diseases. — Besides; admitting Brownus notions of indirect & direct debility, I fail totally at a loss, upon his principles, to understand the mode in which an accumulation of irritability can take place, in the heart & vessels, while the blood, the natural stimulus of these parts, is always present. — No instance of accumulation of irritability, in other parts of the system, while under the operation of the wonted power of accustomed stimuli, can be pointed out; for accumulation of

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irritability is the effect of their absence or diminution; and wherefore are we bound to admit such to take place in the heart, while the blood is there, and there without a feebler power. — We are therefore constrained to look for another explanation of the cause of reaction; or to acknowledge, that we are yet ignorant of the agents of this singular phenomenon.

— Wilsons Theory. —

Sensible of these defects in the theory of Brown, Wilson has endeavoured to substitute another, in which he professes to have avoided inconsistency, and to have better explained the changes, which take place during fever. —

He divides the animal machine into two great classes of functions — the vital & animal; including those, commonly called natural, in the former expression. — He denies that the mere exhaustion or fatigue of the animal functions

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can produce disease; but calls that condition productive of disorder an atony. — So soon as this atony is communicated, directly or indirectly, to the vital functions, the incipient symptoms of febrile disorder are perceptible. — There is now no agent left to repair the waste of vigour. This renovating power, seated in the vital functions, is itself impaired. — Hence, the natural stimulation of the blood is incapable of exciting the natural vigour of arterial action; and no way is left, of restoring the tone of the system, but by the application of a preternatural stimulant to the heart and arteries. —

This preternatural stimulant, is the unavoidable consequence of their debility. — "The secretory "organs, no longer performing their functions, the more "irritating, and noxious parts of the blood, which "ought to be expelled from the body, are retained; "and soon excite the heart & blood-vessels to an "action, as powerful as the healthy action, often more so"

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If the reaction over come the debility, secretion, and consequent elimination of the offending matter, ensue; and restore health to the functions. — But if not, the preternatural excitement of the heart & arteries, must soon exhaust them; and, no means of excitement being left, death must finally ensue. —

The same effects may be produced by the absorption of any noxious matter into the circulation; or by the interruption of the secretory operations for a certain time. —

The whole of Wilson's theory is founded upon the notion, that, by the interruption of secretion, the blood becomes more noxious, and irritating; a position, of which we have no manner of proof. —

He also talks of secretion, as if it were obedient to the vis a tergo, and submitted to mechanical stimulation: whereas, the labours of Bichat and Hunter, have sufficiently established the independent action of the arterial capillaries. — There is

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another prominent objection to this theory, inasmuch as it does not explain the mode in which the heart and arteries recover their natural tone. — According to the author, they have lost a portion of irritability, and when he applies his preternatural stimulants, a further exhaustion must necessarily take place. —

Upon the whole therefore, the theory of Wilson, with all its apparent plausibility, is founded upon a supposition; and is but an inadequate explanation of febrile phenomena. —

Clutterbuck's Theory.

The last theory, of which I shall take notice, is that of Clutterbuck. —

This author refers all febrile diseases to a topical inflammation of the encephalon, as their primary seat. — His arguments are summarily the following. —

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1st The animal functions, to wit, sensation and voluntary motion, and likewise the powers of the mind, all of which depend immediately upon the brain; and vary with every variation in the state of this, are constantly and greatly deranged in every case of proper fever. —

2d The vital functions, to wit, respiration & circulation, are not so immediately dependent upon the brain, and are therefore much less liable to synchronous derangement. — The state of respiration and circulation is therefore more slowly, sometimes not at all, affected. — Hence, the primary seat of fever is not to be found in the general vascular system; for in many cases of the disease, the heart and arteries continue their functions in a great measure unchanged. —

3d The irregularity of the action of the natural functions shew them to be secondarily affected. — The state of the stomach has been assigned as a cause of fever; but

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no affection of the stomach *per se*, could occasion such symptoms as head-ache or vertigo, nor constitute the immediate cause of apoplexy or palsy. — All these are manifestly affections of the brain and its functions. — "Granting that the functions of "the stomach are commonly disordered in fever, the "same is more especially true of the functions of the "brain, which, as shewn above, never fail to be "perverted in this disease. — The disordered state "of the brain therefore <u>may as well be supposed</u> "the primary cause of the disturbance observed "in the functions of the stomach in fever, as the "reverse, and this, I have no doubt, is actually the "case."

4th The alternation of fever with inflammation; the analogy between fever and inflammation, in regard to their cure and pronenesp to repetition; and the resemblance between fever and phrenitis, constitute his fourth argument. —

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Were I to admit the truth of all these arguments, still they would be insufficient to prove that the brain is always the primary seat of fever. — Its remote and inaccessible situation, shields it from the operations & immediate influence of most of the morbific agents. They can act upon it only through some medium, which medium must, strictly speaking, be called the primary seat. — It is natural to suppose that so delicate and important an organ as the brain, will be frequently a participator in the impressions which external agencies fling over the system; and that its greater mobility will be exhibited in the irregular action of its visible dependencies. — But even from the author himself, enough may be gathered to shew, that the stomach

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acts an important part in most febrile affections; and his <u>own reasonings</u> render it a competitor with the brain for disease-producing ascendancy. The state of the brain in a great many febrile diseases, especially hectic; the experiments of Donald Monro & Le Gallois; the slight dependence of the circulatory organs upon the brain; the rising importance of the spinal marrow in medical estimation; and the close & immediate sympathy between the stomach & circulatory organs; are powerful reasons for rejecting the theory of Hutterbuck, and for supposing that, although the brain may be sometimes an active agent in the extension of disorder, it is but one part of a wide system of sensibility liable to the baneful influence of morbific impression, and of which, almost all its departments, are fitted to impose a more or less extensive disorder upon the fabric to which they belong.

Part Second.

Some attempt at a better Theory of Reaction.

Having thus cursorily reviewed the most prevailing systems of opinion concerning the seat and causes of febrile diseases, and, having found them all inconsistent with the known phenomena of life, I proceed to offer a new theory, which will, I believe, accord better with these phenomena than any hitherto suggested. At any rate, this theory will deserve the more indulgence, because it cannot, however visionary it may be deemed, lead to any practical errors; but, on the other hand, will be found to approve of that practice which is generally adopted by the most enlightened men of the profession.

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As the laws which govern the animal functions, are uniform and universal, these functions will be regularly performed while the circumstances, under which they commenced their operation, continue unaltered. There is not therefore any reason for supposing, that, in a system of such perfect harmony, any spontaneous disorders are likely to be produced. — But, beyond this circle of functions, held in subjection by one all-pervading principle, events, and actions, are under an influence, which does not harmonize with the ruling principles of animal life. The laws of chemistry, and mechanics, are not at all associated with each other, or with the laws of vitality. Hence the operations of each are occasionally interrupted, or modified by the power of the others; hence external influences are ever interfering with internal order, and the animal economy is disturbed by the inroads of unwonted visitants. — To guard against the injurious intrusion of such

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guests, Nature has invested most of the organs, by which extraneous matter is conveyed into the system, with a capacity to discern such things as would be most suitable to the order of its administration; and to reject such as would disturb the internal harmony. — Hence we find, that, under circumstances of the utmost constitutional derangement, no unusual ingredient is to be discovered in the chyle, or the blood. —

But to connect the animal with the external world, and to invest it with those characteristic qualities by which it is distinguished from a vegetable, she has bestowed upon it an apparatus, by means of which it may hold communication with surrounding objects, and feel the impressions of pleasure and of pain resulting from their action. — This apparatus pervades the whole animal machine; supplies it with activity; and appears to constitute the bond of union, which unites that machine

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with all its dissimilar and scattered functions, into one consentaneous microcosm. — It would be foreign to my present purpose, to inquire, by what parts of the animal frame, this apparatus is constituted; or what is the precise mode of its operation. — Enough has been said, by writers upon this subject, to shew, that there is good reason to suppose, that the nervous system does not alone compose this apparatus, but that there is still concealed from our limited view, an important part of the machinery of sympathy. — Whatever may be the agent or agents of this mysterious influence, which pervades the very penetralia of every animated being, it is only on the external surface of the body, and along the course of that great canal, through whose ramifications they are allowed to pass, that foreign agents hold communications with the internal animal economy. — The skin,

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and the mucous membrane of the nose, mouth, bronchia, and primæ viæ, are therefore alone accessible to agents, which do not intrude by mechanical violence; or are not permitted to pass the ordeal of absorption. —

Notwithstanding all these precautions, with which benignant Nature has fenced in the tranquillity of the animal functions, the necessity of connecting them with surrounding objects, has opened an avenue, through which, intrusive impressions have invaded her secret domain, and interrupted its regularity and its peace. —

Of all the before mentioned avenues, through which impressions are made on the system, the Stomach, both on account of its situation and connexions, affords the disturbers of internal harmony the most easy entrance. ~~Through the nose mouth~~. Through this organ passes all that food from which the animal derives its sustentation. —

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To this organ, all the most important functions of the system are closely allied by the bonds of association. The least disorder in the stomach throws the whole system into an uproar. — A slight blow extinguishes life in an instant. A little nausea or acidity, invades the very seat of thought, and introduces disease and impotency into the most secret recesses of the apparatus of life. — While it enjoys this unbounded influence, and is continually exposed to the operation of all those articles which compose the sustentation of the system, the stomach is unfortunately invested with an extreme mobility. — Hence, when disease invades the animal frame, and irregularity is observable in its functions, we ought, most commonly, to find its punctum saliens in the Stomach. x

Through the mind, the senses, the skin, and membranes of the nose, mouth, bronchia, and primæ viæ, disease

x Vide Dr Chapman's Therapeutics & Materia medica vol I pages 51 & 52. —

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may find an avenue; but it seems reasonable to suppose, that the stomach is most frequently the centre of morbid action. — Its superior impressibility & dominion, are universally acknowledged; for to it we all address those counteractive impressions denominated remedies; and, after such a practical confession of its mobility and power, it is surprising that men should still be found ready to deny its extensive agency in the production of disease.

To whatever part of the recipient of impression any attack may be directed, if that attack be powerful & continued, a considerable change must be produced in the action of the part. — This change may be confined to the organ attacked; or it may be communicated to other organs, or to the whole system. — It has been ably shewn, by Wilson, in his essay upon this subject, that the change of action communicated to parts beyond the immediate

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operation of the external agent, is not always like that produced in the communicating organ; but that, although debility, or feeble action from debility, is communicable, the state of the organs primarily & secondarily affected may be widely different. When, by overstimulation, an organ is exhausted, the ordinary stimuli do not produce the ordinary vigour of action: But, when a feeble action results, not from overstimulation, but from abstraction of the wonted stimulus, the application of that stimulus produces an unusually great action. — If however these changes are sufficiently powerful to communicate changes to other organs, then we see these other organs, in both cases, less sensible to the operation of their wonted stimuli. — Whatever may be the cause of enfeebled action in the organ primarily affected, and whatever may be the quantity of excitability in that organ,

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the organs secondarily affected are always in an exhausted condition, and respond less forcibly to the operation of their natural stimuli. — We have an example of this in cases of inanition. There the effect of food upon the stomach is most violent, while light produces hardly any effect upon the eye, or warmth any effect upon the hand. — The eye & hand are as little alive to the operation of these stimuli, as if their insensible condition had been produced by an exhaustion of the excitability of the stomach. —

When therefore the potency of the cause, or the connexions of the organ, extend the debility over the system, all the system, save that one organ, must be in that condition in which the usual stimuli do not produce the usual action. — Now, as accumulation of excitability has never been shewn to take place in any organ, while the cause by which it was abstracted still operates; and

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while the wonted stimulus of the organ is present, we are left without any good reason for admitting accumulation of irritabilety in the heart & blood-vessels to be the proximate cause of febrile reaction. — While the agent of debility continues to operate upon the external organ, and while that organ maintains its connexion with the system, the parts over which it has flung its charm, must still feel the influence of its spell. — In vain therefore shall we look for reaction in the heart & arteries, if we wait for the accumulation of excitabilety, to render them sensible to the ordinary stimulus of arterial blood. — Nothing but a cessation, or diminution of the operation of the morbific cause, would allow such an accumulation; and the very phenomena of reaction show, that the commencement of this salutary process is at a point far removed from the primary seat of disease. —

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Deprived then of this plausible theory of reaction, we are left without any good explanation of this mysterious process; and must revert to the symptoms for an elucidation of its causes & its seat. —

The immediate cause of the debility observable in the commencement of febrile diseases, is a want of susceptibility to the operation of stimuli. — Reaction must therefore be produced by an increase of susceptibility, or of stimulus. — We have already shewn that there can be no increase of susceptibility, at least by mere accumulation; & we are therefore constrained to look for the cause of reaction in those means by which excitability may be increased, or the power of stimuli rendered greater. —

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The beautiful and accurate experiments of Bichat, have conclusively demonstrated the immediate dependence of all the most important organs upon the blood, both for nutrition, and stimulation. — Remove this fluid, & the susceptibility of the organ, from which it is abstracted, soon ceases to respond to its wonted stimuli. — If then, the blood do not communicate excitability, its presence is absolutely necessary to its operation. — The celebrated John Hunter was also among the first who observed the intimate dependence of irritability upon the presence of arterial blood, and who demonstrated, that wherever it accumulates in unusual quantity, an unusual degree of excitability is there perceptible. — Knowing the importance of arterial blood, in the operations of susceptibility, and observing how small a portion of this fluid flows through the capillaries, during the incipient stage of fever, we are naturally led to look for the cause of reaction in that power, by which the blood is restored to these vessels. —

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As the blood has almost entirely left the minute vessels, the quantity contained in the great ones is unusually great, and must cause a considerable degree of distention. This distention has been assigned as the proximate cause of reaction, by a practitioner of this city. —

That this is not the sole cause, is evident, from the following considerations. — 1st It remains to be proved that mere distention does operate as a stimulus to the heart and arteries — 2d Admitting that it does so operate, like all other unusual stimuli, its tendency would be towards greater exhaustion. — 3d As the natural force of arterial action was not sufficient to resist the morbific impression, it will not be sufficient to overcome it. — 4d. The gradual accumulation of the blood in the large vessels, may make some impression upon the vessels which are immediately dependent upon the action of the heart, & larger arteries, but whether it can force this blood beyond that part of the vascular system into which this action usually impels it, and cause a greater quantity to circulate

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in the "capillaries of independent action"* is a point hardly to be conceded. — It is the resistance, or feeble action of these capillaries, which causes the distention of the great vessels; and they cannot increase this distention, beyond their power of resistance or inaction. —

We are at length constrained to look for the cause of reaction, not in any agent operating upon the existing excitability, and thus tending still farther to exhaust it; not in an accumulation of irritability during the action of that cause by which it was diminished, but to some power, by which a new or increased production of excitability is supplied, to take the place of that which has been abstracted by the morbific agent. —

Secretion is the cause of the change of arterial into venous blood; and secretion is a capillary action, which has suffered diminution in the general lesion. — Of consequence, that change must be less completely made, during the cold stage of fever; and the blood

* see Bichat's Researches & John Hunter On the blood. —

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must flow from the arteries into the veins in an arterial condition. * In this condition, it arrives in the lungs, and, separated from the atmospheric agency by a very thin & permeable membrane, is divested of as much carbon as to convert the whole of the inhaled oxygen into carbonic acid gas. — The balance of secretion, and decarbonation is now lost. — The whole circulating mass must pass through the lungs, & be exposed to the process of decarbonation; while but a small portion of it can reach the secretory organs; which are, at the same time, so enfeebled as to alter but little even that small part. — Each succeeding revolution presents to the lungs a less venous fluid. Each succeeding revolution finds it in possession of a higher degree of that peculiar quality by which the parts in contact with it appear to be imbued with excitability†. — At length, nearly the whole mass of blood, both in the arteries and veins, is highly arterial; and parts, seldom subjected to the undiluted agency of this potent fluid, are gorged with an unusual quantity. —

* Vide "Hunter on the Blood"; Bradford's edition; Vol 1st page 64. —
† Vide Bichat's Researches page 2d art. 6th.

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The heart, the arteries, the veins, the organs of secretion, are now occupied by blood possessing, in an eminent degree, the power of developing, if not of creating, excitability. — Again by degrees the susceptibility to the influence of habitual stimuli returns, and is often increased to a morbid degree. — With this susceptibility returns of course the power of action; and the functions of the animal machine are performed with even more than common activity. — The heart beats more vigorously; coldness departs, heat succeeds; the colour of the skin returns, & becomes unusually great. — After a time a moisture appears upon the forehead, accumulates into a sweat, and gradually extends itself over the whole body; exhibiting evidence, that the secretory actions of the system have been restored. —

By this restoration, and increase of secretory action, the natural proportion between

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decarbonation and secretion is restored, and the blood in the veins presents a venous appearance, indicative of the abstraction of its too patent qualities. —

This is the course of an Intermittent Paroxysm. — The subsidence of action again presents a field for the operation of the morbific agent, which again produces the same round of symptoms. —

But the reaction may be so great as to transcend the secretory process, and thus prevent the restoration of an equilibrium between decarbonation and secretion. — In such cases, a continued simple Inflammatory Fever is the consequence. —

The same effect is produced, when the power of the exciting cause is so great as to hold the outposts of circulation in subjection, in spite of the stimulating sanguineous influence. —

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must soon become diminished, and offer but a feeble resistance to the invoachments of the morbific power. — A debility of a most dangerous kind must now succeed. — This kind of fever has been denominated Synochus by Dr. Cullen. —

Even from their very commencement, some fevers are characterised by unusual prostration, and apparent debility of the powers of life. — In such cases, the morbific impression seems to triumph over the reactive energy, and to oppose a resistless influence to the efforts of restoration. — An irregular and feeble action indicates the struggle between stimulation and impression; and exhibits deplorable evidence of the existence of Typhoid Fever. —

From the whole tenor of my reasoning, it appears, that reaction is, at least in a great measure, the effect of a want of due propor-

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tion between the secretory and pulmonary action. We are naturally led to the conclusion, that if by any chance, the secretories should so escape a morbific influence, which involves the rest of the system, as to continue their action, no reaction can be expected, nor any power counteractive of disease. — Accordingly we find, that some of the most fatal maladies on record have been accompanied by cutaneous discharges. — ×

Strange as it may appear, even the circulatory system may escape the effects of a power which is destroying the vitality of the rest of the machine, and, while the patient is fast approaching to the termination of his career; his pulse and skin may afford us no intimation of his danger. — Authors of experience have therefore warned us to beware of a natural pulse, & cool skin, under such circumstances. +

× Fordyce's 5th dissertation. — + Dr Benjn Rush. —

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we can easily see the propriety of this advice; for no agent of reaction except the blood is known, and, as it has not undergone any change, it cannot offer a counteractive influence to the effects of the morbific virus. —

In fine, the nature and phenomena of fever may be infinitely diversified, according to the proportion between the morbific agent, & the powers of life; the importance, & connexions of the primary seat; the number of functions involved; the nature of the morbid impression; and the condition of the surrounding atmosphere. Indeed, there is not one single case of fever, amidst the almost infinite variety described by authors, which may not be easily accounted for, according to the foregoing theory. —

All other theories are defective in this, that they seem to consider the secretory organs as obedient to the action of the heart, & arteries; —

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They continually revert to chemical & mechanical principles for the illustration of vital action; and suppose, that a set of vessels performing a wonderful variety of living operations, can be made to produce the same effects, by becoming simple mechanical tubes, and submitting to one single mechanical power. All of them err in one remarkable point, that, while they admit the diminution of susceptibility over the whole system, they only propose such agents of reaction as would tend to a still greater diminution; whereas it is evident enough, in most cases of fever, that the susceptibility of the whole system is increased. — We are therefore forcibly led to the conclusion that the agent of reaction is one, productive of an increase of the power of excitability; and we hope we have shewn

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satisfactorily, that the changes produced upon the blood, during the stage of debility, are sufficient to cause all the phenomena of reaction, and to explain them upon pathological principles, independently of the laws of mechanics and of chemistry.

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